

ABSTRACT

One or more components of a wellbore drilling assembly utilize a modular construction to facilitate assembly, disassembly, repair and/or maintenance of a wellbore drilling assembly and/or to extend the overall operating capabilities of the drilling assembly. In one embodiment, a modular construction is used for an APD Device, a motor driving the modular APD Device, a comminution device, and an annular seal. Individual modules can be configured have different operating set points, operating parameters and characteristics (e.g., rotational speeds, flow rates, pressure differentials, etc.) and/or different responses to given environmental factors or conditions (e.g., pressure, temperature, wellbore fluid chemistry, etc.). In one embodiment, the high-pressure seals used in conjunction with the APD Device and/or motor is a hydrodynamic seal that provides a selected leak or flow rates. Optionally, the seal is modular to provide different degrees of leak rates and/or different functional characteristics.